CHEMICAL BIOLOGY

https://cbi.jhu.edu/

Overview

The Chemistry-Biology Interface (CBI) graduate program provides students with training that enables them to challenge the traditional boundaries currently separating chemistry from biology. Upon completion of the program, CBI students receive a PhD in chemical biology.

Faculty members come from diverse departments such as:

Chemistry (http://chemistry.jhu.edu/), Zanvyl Krieger School of Arts and Sciences
Biology (http://bio.jhu.edu/), Zanvyl Krieger School of Arts and Sciences
Pharmacology & Molecular Sciences (http://www.hopkinsmedicine.org/pharmacology_molecular_sciences/), School of Medicine
Biochemistry & Molecular Biology (https://publichealth.jhu.edu/departments/biochemistry-and-molecular-biology/), Bloomberg School of Public Health
Biomolecular and Chemical Engineering (https://engineering.jhu.edu/chembe/), Whiting School of Engineering
Materials Science and Engineering (https://engineering.jhu.edu/materials/), Whiting School of Engineering
Biophysics (http://biophysics.jhu.edu/), Zanvyl Krieger School of Arts and Sciences
Biophysics and Biophysical Chemistry (https://biophysics.med.jhmi.edu/), School of Medicine
Molecular Microbiology & Immunology (https://publichealth.jhu.edu/departments/w-harry-feinstone-department-of-molecular-microbiology-and-immunology/), Bloomberg School of Public Health

The nature of the program provides students with an expansive choice of faculty thesis advisors (preceptors), whose research spans the range of the chemistry-biology interface.

CBI coursework includes classes in chemistry and the biological, biochemical, and/or biomedical sciences. Students complete 10-week research rotations that enable them to make informed choices of research projects. In addition, participation in a weekly chemistry-biology forum helps students develop a comprehensive awareness of the field.

The CBI program formalizes a long-standing tradition of research at the Johns Hopkins University. We became one of approximately 20 CBI programs nationwide to receive support from the National Institutes of Health in the form of a predoctoral training grant. In addition, the Maryland Higher Education Commission approved a request to establish a PhD degree in chemical biology at Johns Hopkins, which recognizes the unique curriculum that CBI students complete.

Graduates of the CBI Program are scientists capable of interdisciplinary research, who approach both chemistry and biology from a more global and health-related perspective.

The average time to degree for the CBI program is six years. More than 60% of our students accepted postdoctoral positions after graduating in academics (Harvard, UPenn, ETH (Zurich), Max Planck (Freiburg)), industry (Bayer CropScience) and government (NIH, CFSAN). Other graduates found employment in industry (Rapafusyn Research and Development and Mars & Co. consulting) and government (Institute for Defense Analyses) directly after receiving their PhD. After completing post-doctoral appointments, former students of the CBI program have gained permanent employment in industry (Zymergen, Janssen BioTherapeutics, Mosaic Biosciences) and government (US Pharmacopeia, US Patent and Trademark Office, CSFAN).

Program Outcomes: oir.jhu.edu/life-science-career-outcomes (https://oir.jhu.edu/life-science-career-outcomes/)

Programs

- Chemical Biology, PhD (https://e-catalogue.jhu.edu/arts-sciences/full-time-residential-programs/degree-programs/chemical-biology/chemical-biology-phd/)

Courses

CBI graduate students are required to complete eight graduate-level courses. Typically, these are completed during the first year at Johns Hopkins.

Required Courses

CBI students are required to take Chemical Biology I (030.619) and Chemical Biology II (030.620) during their first year at Johns Hopkins.

All CBI students are required to register for CBI Forum (030.613/614) every semester during their graduate career. Students are also required to complete the Responsible Conduct of Research (RCR) course (360.625). CBI Forum and RCR do not count toward the eight required courses.

Selecting Your Courses

With the help of a faculty advisory committee, students select the remaining six courses based on their personal academic interests. At least two of these courses must be offered by departments other than the Department of Chemistry, and two must be chosen from the list of Foundation Courses.

Foundation Courses

AS.030.449 Chemistry of Inorganic Compounds
AS.030.453 Intermediate Quantum Chemistry
AS.030.601 Statistical Mechanics
AS.030.625 Advanced Mechanistic Organic Chemistry I
AS.030.626 Advanced Mechanistic Organic Chemistry II
AS.030.677 Advanced Organic Synthesis I
AS.030.678 Advanced Organic Synthesis II
AS.250.685 Proteins and Nucleic Acids
AS.250.689 Physical Chemistry of Biological Macromolecules

Representative Courses

AS.020.312/612 Introduction to the Human Brain
AS.020.650 Eukaryotic Molecular Biology
AS.020.662 Single-Molecular Approaches to Biology
AS.020.686 Advanced Cell Biology
AS.020.687 Foundations and Applications of Molecular Biology
AS.020.739 Topics in Biochemistry
AS.250.641 Seminar on Mucosal Protection
AS.250.649 Introduction to Computing
AS.030.405 Introduction to Computational Chemistry
AS.030.423 Nucleic Acids in Chemistry and Biotechnology
AS.030.441 Spectroscopic Methods of Organic Structure Determination
AS.030.442 Organometallic Chemistry
AS.030.615 Special Topics in Bioinorganic Chemistry
AS.030.623 Molecular Synthetic Biology
AS.030.634 Topics in Bioorganic Chemistry

AS.030.635 Methods in Nuclear Magnetic Resonance
AS.030.648 Biocatalysis: Fundamentals, Recent Advances, and Industrial Applications
AS.030.681 Nucleic Acids: Fundamental Chemistry and Applications
EN.510.436/636 Biomaterials for Cell Engineering
EN.510.621 Biomolecular Materials I – Soluble Proteins and Amphiphiles
EN.510.636 Biomaterials for Cell Engineering
EN.540.405/605 Modern Data Analysis and Machine Learning for Chemical and Biomolecular Engineers
EN.540.614 Computational Protein Structure Prediction and Design
EN.540.622 Introduction to Polymeric Materials
EN.540.628 Supramolecular Materials and Nanomedicine
EN.540.635 Software Carpentry
EN.540.637 Application of Molecular Evolution to Biotechnology
ME.100.706 Fundamentals of Protein Crystallography
ME.100.709 Macromolecular Structure and Analysis
ME.100.710 Biochemical and Biophysical Principles
ME.100.716 Analyses of Macromolecules
ME.110.728 Cell Structure and Dynamics
ME.200.704 Introduction to Drug Discovery
ME.200.707 Drug Discovery Case Studies
ME.260.656 Malariology
ME.260.708 Molecular Biology and Genetics
ME.260.709 Molecular Biology and Genomics
ME.260.712 Introductory Molecular Immunology
ME.260.812 Great Experiments in Biology
ME.330.707 Graduate Pharmacology
ME.330.709 Organic Mechanisms in Biology
ME.330.712 Introduction to Glycobiology
ME.330.715 Graduate Pharmacology II
ME.330.804 Mass Spectrometry in an Omics World
ME.340.711 Bacterial cell and developmental biology
ME.340.712 Bacterial Signaling and Communities
ME.360.728 Pathways and Regulation
ME 800.707 Computational Biology and Bioinformatics
PH.120.600 Biochemistry I
PH.120.601 Biochemistry II
PH.120.602 Introduction to Molecular Biology
PH.120.603 Molecular Biology of Pandemic Influenza
PH.120.608 Genetics and Gene Therapy
PH.120.613 Nucleic Acid Chemistry
PH.120.620 Fundamentals of Reproductive Biology
PH.120.621 Molecular Endocrinology
PH.120.622 Molecular and Cellular Mechanisms of Reproduction
PH.120.624 Cancer Biology
PH.120.626 Principles of Cell Biology
PH.120.627 Stem Cells and the Biology of Aging and Disease
PH.140.615 Statistics for Laboratory Scientists
PH.140.636 Perl for Bioinformatics
PH.140.651 Methods in Biostatistics I
PH.187.610 Public Health Toxicology
PH.187.632 Molecular Toxicology
PH.222.651 Advanced Nutrient Metabolism
PH.260.611 Principles of Immunology I
PH.260.612 Principles of Immunology II
PH.260.623 Fundamental Virology
PH.260.627 Pathogenesis of Bacterial Infections
PH.260.633 Autoimmune Diseases of the Endocrine Glands